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OUR LAND RESOURCES

We Can Use Them and Keep Them

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In recent months the vigorous arguments on population and food production have focused attention on the importance of our land resources. I am not prepared to discuss the problem of population control, but let us look at the situation in the light of our land resources. Most everyone, I believe, recognizes that an adequate amount of productive land — properly used and so protected that it will remain permanently productive -- is an important element in maintaining a prosperous agriculture and the economic stability of any nation.

Inventory of Land Resources

Of the 1,905 million acres of land in the United States, we have 403 million acres in use as cropland, 707 million acres of grazing land, 602 million acres of forest land, and 193 million acres of miscellaneous land.^{2/} But not all of the 403 million acres currently being used as cropland is suitable for growing cultivated crops. About 43 million acres, or approximately one-tenth, should be retired to grass or trees because it is either too steep, too eroded, too shallow, or otherwise unsuited for cultivated crops.

In this Nation we have exploited our land resources. We have allowed them to decline at an incredibly rapid rate. Soil erosion has severely damaged about 282 million acres. Another 775 million acres have lost 25 to 75 percent of topsoil through erosion. Some of this damage, however, is not immediately evident. During the last few years the seriousness of soil lost by erosion has been partly obscured by temporary good crop yields resulting from the increased use of fertilizers, lime, manure, and improved crop varieties, as well as by unusual favorable weather conditions. Nevertheless, the land is being dangerously injured and will continue to deteriorate unless it is safeguarded with the proper combination of conservation practices. When we realize that erosion is still proceeding at a critically rapid rate on 115 million acres and at a serious rate on 120 million acres of our cropland, we begin to get some idea of the magnitude of the situation. Moreover, it is estimated that 500,000 acres of cultivated land is

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^{2/}U.S.D.A. Miscellaneous Publication 663.

being damaged so severely each year that it becomes unfit for further immediate cultivation.

How much good land do we have left on which to grow cultivated crops? We don't know exactly. But we do have a fairly good estimate based on sample surveys covering about 270 million acres. By projecting these sample surveys to other unsurveyed areas that the samples represent, we find about 460 million acres of land suitable for regular cultivation. To offset the 43 million acres^{3/} of presently cultivated land unsuited for cultivation, the surveys indicate about 100 million acres of land now in grass or trees as potentially suited for cultivation with adequate safeguards and protection. About 21 million acres or more of these 100 million acres will require drainage before they can be used for cultivation. About 8 million acres will require irrigation. Much of this unimproved land will require clearing of trees before it can be cultivated.

Table 1 on the following page gives an idea as to the capability of the land resources in the United States. These estimates indicate that with the use of conservation farming systems about 360 million acres of our present cropland and 100 million acres of land now in grass or trees (some in need of clearing, drainage, or irrigation) could be safely used for cultivated crops.

Soil Erosion

When raindrops fall on a bare soil, the impact stirs up and loosens the tiny soil grains. Pools of muddy water soon collect on the surface. Then the mixture of water and soil is splashed by succeeding drops, often as much as two feet or more into the air. The soil splashed about during a single rain may amount to 100 tons or more per acre. Since the splash from each individual raindrop may be in any direction, no net movement of soil occurs from the splashing process alone if the land is level. On slopes, however, the downhill splashes are longer, on the average, than those in the uphill direction. The splashing itself thus actually produces a net movement of soil. Then during every storm of any consequence, water flows downhill over the soil surface. Whenever such flowing water is muddy, it is carrying soil with it, and we have sheet erosion in action. Some of the soil may be carried a few feet and some of it hundreds of miles before it comes to rest.

Growing plants or litter of any kind on the ground surface reduces the spattering effect of raindrops. A good cover breaks the fall of each drop, protects the soil, and slows the speed of the runoff if any occurs. Some erosion takes place, to be sure, but it is partly by solution and is almost imperceptible in amount unless measured over hundreds or thousands of years.^{4/}

^{3/}In addition to the 43 million acres of regularly cultivated land, there are about 20 million acres of occasionally cultivated land that should be converted to grass or trees permanently.

^{4/}Numerous measurements made at the soil and water conservation experiment stations have shown the wide difference between geological erosion and man-induced soil erosion. For example, at the Statesville, N. C., station, measurements showed that on land planted to cotton year after year, accelerated erosion removed an average of 31.22 tons of soil per acre annually; while on the same kind of land, geological erosion removed only 0.002

Table 1.--Distribution of land in farms in the United States according to capability

(Estimates based on surveys of limited sample areas; subject to revision as more land is surveyed)

		Approx. Acres (millions)	Approx. Acres (millions)
Suited for regular cultivation.....			460
CLASS I	Very good land; few or no limitations; can be cultivated safely with ordinary good farming methods.....	70	
CLASS II	Good land; moderate limitations or hazards; can be cultivated safely with moderately intensive treatments.....	170	
CLASS III	Moderately good land; severe limitations or hazards; can be cultivated safely with intensive treatments.....	220	
Suited for limited cultivation.....			95
CLASS IV	Fairly good land; very severe limitations or hazards; suited for some forms of limited cultivation or for limited choice of crops but usually best suited for pasture or hay...	95	
Not suited for cultivation but suited for grazing or forestry.....			554
CLASS V	With not more than slight limitations.....	40	
CLASS VI	With moderate limitations.....	250	
CLASS VII	With severe limitations.....	264	
Not suited for cultivation, grazing, or forestry.....			33
CLASS VIII	Suited for wildlife or recreational use, or for watershed protection purposes.....	33	
Total land in farms reported by the 1945 Census of Agriculture.....			1,142

4/—continued

of a ton of soil per acre annually. At Zanesville, Ohio, it was found that the average erosion loss of soil from an area used continuously for corn was at the rate of 99.3 tons per acre annually, while for the same kind of land used for grass the loss was only 0.028 ton of soil per acre per year.

Nature's soil-forming processes in the humid regions took place under such protective cover. Soils were formed, leisurely, as the underlying rock materials weathered and disintegrated; and generations of growing things added organic matter at the surface. Geological erosion, proceeding slowly through the ages, may actually benefit soils rather than harm them.

Wherever sloping land is cultivated or left bare, erosion takes place many times faster than it did under the protective cover. We call this accelerated erosion, or soil erosion. Experiments show that erosion on clean-cultivated land may be a thousand times faster than on protected land. Accelerated erosion also damages grasslands if the grass is thinned by overgrazing. It damages sloping woodlands wherever the cover is inadequate to protect the land. Whenever erosion is speeded up as a result of man's activities so that it removes all or part of the topsoil, we call the process "soil erosion."⁵

There appears to be confusion in the minds of some people as to the critical difference between "soil erosion" and "geological" or "normal" erosion. We need to be very clear on this point. We need to recognize the two processes -- geological erosion and soil erosion. One is very slow and steady, in which the loss of the topsoil is compensated for through soil formation from the materials beneath; and the other (soil erosion) may be critically rapid where the land is improperly managed -- that is, the rate of soil erosion exceeds that of soil development. When we lose the precious topsoil with its organic matter and myriads of living macro- and micro-organisms so essential to a productive soil and thereby expose a hardpan or claypan layer, obviously we reduce the capacity of the soil to produce. Or, when we lose both the topsoil and the subsoil and expose underlying bedrock of sandstone, shale, limestone, granite, etc., we have little left to work with. The addition of fertilizers and lime, the use of hybrid corn, disease and pest control measures, etc., are of trivial value if the soil is gone. But if we retain the soil, we can often materially increase its productivity by using improved varieties, fertilizers, and other good farming methods.

Now and then we still see statements made by people (perhaps with good intentions but inadequately informed) which imply that we need not worry about the loss of topsoil. They cite cases where subsoils that have been intensively treated, produce good crops. It is true that in some areas where the soil is underlain by loess or alluvium, or other deep friable material, the loss of topsoil is less serious than it is from a shallow soil. Through intensive treatment (often costly, however) such lands usually can be at least partially reclaimed for cultivation over a period of years. Such treatment is possible only if the land surface is still relatively smooth and free from deep gullies. If deep, branching gullies have been formed, the cost of the grading necessary for reclamation may be prohibitive.

Modern Soil Conservation

Soil works for man. Like any other worker, in order to get results the soil must be used within but not beyond its capability. And it must be treated in accordance with its needs. That is to say, to insure the permanent maximum productivity of land it must be used in accordance with its capability and treated according to its needs. To do this necessitates the bringing together as a single function many scientific fields -- agronomy,

soil science, engineering, hydrology, forestry, biology, range management, farm management, etc.

Putting these various fields of science to work together so that they operate as a single function in developing a complete soil and water conservation program for a farm or ranch is not simple. It is an intricate and complex job. To attempt to do this job on a piecemeal basis or to try to apply these sciences independently of each other is to invite trouble and usually failure.

No two farms are alike. Each farm requires its own particular treatment for sustained production. An individual plan must be worked out for each farm in accordance with the capability and needs of the land and in harmony with the type of farming the farmer wants to follow. Nearly all farmers need specialized, scientific assistance on their own farms to solve their land and water problems.

More simply stated, soil conservation is the judicious use and treatment of the land. It means using the land for purposes to which it is adapted. It means farming to produce the greatest amount of the products most needed; and finally, but of equal importance, it means at the same time protecting the land so it will continue to yield satisfactorily.

Every practice that helps keep the land productive is a tool of conservation. Fertilizers, lime, manure, crop rotations, cover crops, crop residues, terracing, contour farming, strip cropping, stubble mulching, grass, shrubs, trees, drainage, irrigation, and many other practices when used in the right combination according to the land's needs are conservation tools. Soil conservation, therefore, includes all measures and methods that help the land to yield the most it is capable of producing without damaging it. This is something different from exploitative farming in which the land is often farmed so as to get the greatest immediate monetary return without concern for sustained production.

Single Practices Will Not Do the Job

Research and experience have proved that reliance on individual conservation measures applied without regard to other needed conservation measures to a farm is invariably ineffective. In fact, in some instances, single measures have not only failed to control erosion and maintain soil productivity, but they have been actually detrimental. For example, terraces without supporting vegetative practices and adequate outlets may serve to concentrate runoff water without controlling it. To illustrate in more detail, a terrace break near the top of a field planted to a clean-tilled crop may cause a succession of breaks in the terraces all the way down the slope as the accumulated volume of water from each terrace above reaches the one below. Severe gullying of an entire field may result from such a series of terrace breaks during one intense rain. If, however, the field is also strip cropped, the close-growing crop in the strip below the point where the break occurs may retard and spread the water from above sufficiently to prevent damage to lower-lying terraces. Along with the terrace system to maintain control of water collected above terrace channels, some type of water-disposal area must be provided. Usually this can best be done by developing broad waterways protected by perennial vegetation in the natural drainage-ways through fields.

Combination of Practices that Fit the Land

The great outstanding accomplishment of modern soil conservation is the technique of integrating, combining, and using all these applicable conservation measures in accordance with the needs and capabilities of the land. These protection and improvement requirements vary with each kind of land -- land made up of unique combinations of soils, slopes, erosion conditions, etc. Thus the combination of these physical features largely determines the combination of conservation practices necessary to maintain (or in some instances to improve) productivity of the land. Some lands (class III) require a complex combination of measures to keep them productive; other lands (class II) need a combination of only a few elementary practices. Some areas (class I) are suited for extremely intensive use, including the production of intertilled crops such as cotton, corn, tobacco, peanuts, etc. Other areas (classes VI and VII), because of such conditions as inadequate rainfall, steep slopes, thin or low quality soils, are unsuited for cultivated crops and should be used for less demanding purposes such as production of grass or trees.

Once the essential physical facts about the land are known, it can be put to its maximum safe use. The proper combination of protective and improvement practices, such as water-disposal systems, including terraces and vegetated water-disposal areas, contour tillage, crop rotations, fertilizers, etc., can be applied with reasonable assurance of success.

Soil Conservation Does More Than Protect the Land

Modern soil conservation does much more than simply protect the land; it results in a great many benefits. It increases the yields per acre. On most farm land it lowers the cost of production, which in turn increases the income to the farmer as well as increases trade for both rural and urban communities. It reduces siltation of reservoirs, harbors, and streams. It lessens damage to oyster beds and to breeding and feeding grounds of fish and other aquatic life. It reduces flood crests of streams and rivers, and results in lessened damage to farms, homes, industrial plants, livestock, highways, railroads, and other property. It helps check drought damage to crops and pastures. It encourages a more flexible and diversified farming system which permits easier adjustments from year to year in the kind and amount of products needed to stabilize our national economy. And it helps improve the nutritional value of the food and feed grown on the land, thus indirectly helping to improve the health of people.

Our National Soil Conservation Program

The first definite step toward a national program of soil conservation in this country was not taken until about 20 years ago -- with the Congressional authorization, in 1929, for setting up a number of soil erosion experiment stations at strategic locations over the country. At these stations experiments were conducted on the processes and rates of erosion under different conditions, and work was done on methods for prevention and control of soil erosion.

It has been about 15 years since our national program of action got under way. Demonstration projects were set up in all parts of the country.

Farmers in these areas cooperated with the Service by installing complete conservation farming programs on their farms. These demonstrations created a keen interest in soil conservation. But demonstrations alone proved inadequate as a device for reaching the large numbers of farmers needing help, that is, on-site technical assistance in getting effective soil and water conservation done in time on the land needing it.

In 1937 the various States began to pass laws that permitted farmers to organize their own soil conservation districts. Then the Soil Conservation Service began to do its conservation work in cooperation with these districts.

There are also other Federal agencies in the Department of Agriculture that play a role in soil conservation work. The Agricultural Conservation Programs Branch of the Production and Marketing Administration makes cash payments to owners and operators for participation in selected conservation practices. The Farmers Home Administration and the Farm Credit Administration makes loans to farmers to promote soil conservation. The Forest Service does conservation work on certain private and public lands, particularly national forests. Both the Soil Conservation Service and the Forest Service are engaged in flood control surveys and operations on certain watersheds authorized by the Congress. The Extension Service carries on educational work in conservation. The Agricultural Research Administration is primarily concerned with research, much of which is directly or indirectly related to soil conservation.

There are still other Federal agencies, as the Grazing Service, Bureau of Reclamation, Office of Indian Affairs, Fish and Wildlife Service, and the Bureau of Land Management in the Department of Interior, as well as many state, county, and local agencies that contribute to the conservation job. In addition, there are several national societies, such as the Friends of the Land and the Soil Conservation Society of America, that are exerting a powerful influence on the furtherance of soil conservation.

Soil Conservation Districts

Soil conservation districts are local units of government, operating under State laws. They are organized and run by farmers. They have the authority to ask and receive help from county, state, and Federal governments. They are not responsible to nor administered by any Federal agency.

All 48 States, Puerto Rico, the Virgin Islands, Alaska, and Hawaii have enacted soil conservation district legislation. Under these laws more than 2,000 districts have been organized since August 4, 1937. They include more than half of all the land and more than three-fourths of all the farms of the Nation. And districts are still being organized at the rate of about 10 to 15 each month.

How Districts Are Organized

Here is the way most of the soil conservation districts come into being. When a group of local farmers desire to organize a district, they petition the State Soil Conservation Committee (sometimes designated as a soil conservation board or commission or similar title) which is established in each

state by law. This committee holds hearings to determine the interest of the people and the need for a district.

After a referendum and favorable vote of the farmers in the proposed area, the State Committee proceeds with the organization of the district. The districts vary in size from a few hundred acres to more than three million acres. They may comprise a single county, several counties, parts of counties or a watershed area.

Local district governing bodies, usually consisting of five members, are then elected or appointed from local farmers. They manage the districts. They have authority to request and receive technical, educational, and other types of assistance from the Soil Conservation Service and other Federal agencies, as well as from state, county, and private sources. Generally, a memorandum of understanding is used to list the kinds and amounts of assistance to be made available. Personnel, equipment, materials, or supplies made available are coordinated by the local district governing board for most effective use.

The Department of Agriculture, through a basic memorandum of understanding with each district requesting help, makes it possible for agencies of the Department to give such assistance as may be available. The Soil Conservation Service then enters into a supplemental memorandum of understanding. The Service furnishes soil conservationists, soil scientists, engineers, foresters, biologists, conservation aids, and other technicians, as well as limited amounts of equipment and planting materials not commonly available to the local districts which request such help. Each district then makes such technical and other aid available to individual farmers.

How Districts Operate

Soon after a district is organized, the governing board proceeds with the development of a short-time and a long-time plan and program. Some erosion problems are so acute that they can't wait. Work on these critical areas must be done now to prevent severe damage to the land. Other problems can wait a few years without so much danger to the land. So the supervisors of a district usually plan to work first on those farms that need it most, instead of accepting applications as they are received.

Each district makes a work plan that shows all conservation jobs that need to be done and how each job should be done. This serves as a blueprint for both the short-time and long-time plans of a district. It is used by the district, farm leaders, and agency representatives as a guide in carrying out land treatments. It also serves as a medium to acquaint people with the soil conservation problems and the job to be done. It is based in part on a conservation survey that is made by soil scientists of the Soil Conservation Service in cooperation with State Agricultural Experiment Stations.

After the work plan has been made for the district as a whole, a conservation plan is made for each farm in the district. These plans must be made in detail to show what each field will be used for and how it will be treated. An individual plan is needed for each farm because each farm is operated as a separate unit; yet each farm plan must dovetail into the plans for neighboring farms to give full protection to all the land of a watershed. Such plans are

made by Soil Conservation Service technicians working with the individual farmers or with groups of farmers. Like the district plans, they are based on the capability of the land which is ascertained by making soil conservation surveys.

Facts Obtained in the Field

An essential step in determining the capability of the land is to make a careful examination of the land in the field. This is done by scientifically trained soil technicians who walk over the ground, bore or dig holes in the soil to determine such factors as depth, texture, permeability, available moisture capacity, inherent fertility, organic matter content, and other soil characteristics that affect the use, management, and treatment of the land. They measure the slope of the land. They determine the amount of soil lost by erosion, the overflow hazards, the wetness of the land, and any other significant characteristics. They note also the present use of the land. These facts are recorded on aerial photographs for later use by farmers, professional conservationists, and others.

Significant Variations in Land Features

The units we use in mapping land are characterized by differences that significantly affect conservation practices, use suitability, crop adaptation, crop yields, and management requirements. In interpreting what the land can do and what it needs, each land characteristic is considered in relation to all others.

The land characteristics and the significant ranges in each that have been found most meaningful are given in a summary attached to this paper.

Land is Classified

With these facts and a knowledge of the climate of the area, the land can be classified according to its capability -- its ability to produce permanently under specified uses and treatments. To state it simply, the land can be classified on the basis of those land features that determine what each kind of land can and cannot do and what it needs to keep it productive.

For each area, soil scientists, professional soil conservationists, and other agricultural specialists, together with local farmers, work out how the land should be used and the practices needed for each kind of land. The land facts recorded on the aerial photographs, research findings, and all technical information are joined with practical farm experience in classifying the land and in working out the right combination of practices to make full use without waste of the land resources.

Land-Capability Classes

The eight land-capability classes range from the best and most easily farmed land (class I) to land that has no value for cultivation, grazing, or forestry but may be suitable for wildlife, recreation, or watershed protection

purposes (class VIII). They fall into two broad groups: Land suitable for cultivation, and land not suitable for cultivation.

Here are brief descriptions of the eight land classes:

Land Suited for Cultivation

CLASS I. Very good land that can be cultivated safely with ordinary good farming methods.

CLASS II. Good land that can be cultivated safely with easily applied conservation practices.

CLASS III. Moderately good land that can be used regularly for cultivated crops in a good rotation but needs intensive conservation treatments.

Land Suited for Limited Cultivation

CLASS IV. Fairly good land that is best suited to pasture and hay but can be cultivated occasionally if handled with great care.

Land Not Suited for Cultivation

CLASS V. Land that is too wet or stony or is otherwise not fit for cultivation but needs only ordinary good management to be used safely for trees or grass.

CLASS VI. Land that is too steep, eroded, shallow, wet, or dry for cultivation but is suited for grazing or forestry if carefully managed.

CLASS VII. Land that is very steep, eroded, rough, shallow, or dry but can be used for forestry or grazing if handled with great care.

CLASS VIII. Land that has some limitation that makes it unfit for cultivation, grazing, or forestry but that may be valuable for wildlife, recreation, or watershed protection. It includes such areas as marshes, deserts, badlands, and mountains.

How a Conservation Farm Plan is Made

Farmers and professional conservationists work together in making conservation farm plans. They go over the farm and study the kind of land they have to deal with on each field, pasture, or wood lot -- they check with the land-capability map. The farmer tells the conservationists what kind of farming he wants to do -- what crops he wants to grow, what live-stock he has, the machinery he uses, and so on. The technician points out what the land is capable of doing and the necessary work to be done to check erosion, control water, and keep the land productive in each field. They look frequently at the land-capability map to see how each parcel of land can be used safely and at the same time produce what the farmer wishes in order to get the most from the farm. Together, they decide which fields to use for crops and where the pastures, meadows, and woods should be. They may decide to change some field boundaries so that the land in each field can be used according to its capability; this may involve changing some

fences and farm roads. Some class VI land now in crops may be put in pasture, meadow, or woods. There may be some class II land that is now idle or in pasture, or woods that may be put safely in cultivation.

When they have decided how each acre is to be used, the conservationist and the farmer discuss the conservation measures needed on each field. They plan the crop rotations and estimate how much fertilizer or lime will be needed on each field. They decide which fields to cultivate on the contour and where to strip crop. They determine which fields need to be terraced or drained, and where to build farm ponds and grassed waterways. They decide which pastures need to be fertilized or reseeded and work out a grazing program. They plan how to manage the wood lots. They may make special plans for food and shelter for wildlife. And they figure out the kind and number of livestock the farm will carry under the new system and plan a livestock program to fit the cropping program. Then they plan how and when the farmer will make each of the changes in land use and install the conservation measures.

When all the details are agreed upon, they are put down in a written plan that includes a simple farm map. This plan then becomes the basis for a cooperative agreement between the farmer and his soil conservation district.

Application

In applying the practices called for in the farm plan, conservation technicians give the necessary supervision for such operations as land leveling on irrigated farms, draining of wet land, constructing ponds, terracing systems with necessary water disposal areas, etc. The district, for its part, may be able to make available such special equipment as ditchers, heavy tractors, or other machinery that an individual farmer could not afford to have himself, because of his limited use for such heavy equipment individually. Such equipment, whether purchased by pooled funds of the district, provided by the Soil Conservation Service, or obtained otherwise, usually is made available to district farmers at a reasonable daily or hourly charge to take care of its operation maintenance.

Sometimes, districts negotiate with private contractors to install some of the practices called for in the conservation farm plans. In the fiscal year 1948 there were more than 14,000 contractors engaged in soil and water conservation work. Of all the heavy equipment used in the 1,864 districts included, 94.4 percent was owned and operated by contractors with districts operating the other 5.6 percent on farms and ranches cooperating with the districts. Soil Conservation Service equipment on loan to districts was 3.3 percent of the total being used at that time.

The district may also help the farmer get planting stock or other materials he needs and lacks on his farm. The conservationist will continue to give the farmer technical help in installing the conservation measures.

Farmers Working Together in Soil Conservation

Group action is speeding up and improving the quality of soil conservation work. Through the group approach farmers are not only doing a better job but there is good reason to believe they will be more likely to maintain

their conservation farming practices when they work with their neighbors in friendly sociable groups. There is also evidence that farmers working together in natural groups, in a neighborly way, carry forward conservation work much faster and at a lower cost to all. Much time of the professional conservationist is saved by the local leaders guiding their neighbors. More of the professional conservationist's time, therefore, is available to give the necessary technical assistance on the more complex phases of the job.

The importance of the group approach as a means of working with more farmers faster becomes increasingly evident when we look at the more than 200,000 applications from farmers who are waiting for technical assistance. At group meetings farmers get an understanding of land capability and of planning techniques, thus reducing the time required for farm planning often as much as 25 percent. Farmers working together, sharing their equipment, tools, labor and enthusiasm are lending impetus in increasing the number of farmers who can be assisted by a technician. This type of cooperation increases the speed and efficiency of application, makes possible a more efficient use of equipment, and gives more assurance that the conservation work that has been put into effect on the land will be maintained.

Accomplishments

By the end of 1948, more than 700,000 detailed conservation farm plans had been prepared cooperatively by farmers and technicians of the Soil Conservation Service. These plans covered around 220 million acres -- about 20 percent of all the farm land of the Nation. The planned conservation treatments were completed, according to each plan, on about 11 percent of our farm land -- around 120 million acres. In addition, 300 million acres of detailed soil conservation surveys have been made -- surveys which are necessary for sound planning and treatment.

The Job Ahead

We have made good progress since our national soil conservation program started in 1933, but about 80 percent of the conservation job remains to be done.

As already mentioned, about a fourth of our cropland is now being damaged at a critically severe rate. This land will be severely damaged within the next 10 or 15 years if it is not protected. Another fourth is eroding at a less rapid but still serious rate. This land should be protected within 15 to 30 years to prevent severe damage.

Erosion damage to the remaining half of our cropland is going on at a less serious rate; some of it is not being damaged at all. This does not mean, however, that this land is producing to its utmost. Better conservation farming methods would increase production on most of it.

We have enough good land left in this Nation to keep us prosperous and well fed if we conserve it while we use it. Modern scientific soil conservation methods have demonstrated this can be done. The question is: Will these techniques be used on enough land before it is too late?

**SIGNIFICANT RANGES IN LAND CHARACTERISTICS
FOR SOIL CONSERVATION SURVEYS**

<u>Effective Depth</u>	<u>Texture of Surface</u>	<u>Permeability: (of subsoil and substratum)</u>	<u>Percolation, in./hr.</u>
Very deep 60" or more	Very heavy	Very slow	Less than 0.05
Deep 36 - 60 in.	Heavy	Slow	0.05 - 0.20
Mod. deep 20 - 36 "	Mod. heavy	Mod. slow	0.20 - 0.80
Shallow 10 - 20 "	Medium	Moderate	0.80 - 2.50
Very shallow 0 - 10 "	Mod. light	Mod. rapid	2.50 - 5.00
	Light	Rapid	5.00 - 10.00
	Very light	Very rapid	10.00 or more
<u>Thickness of Surface</u>	<u>Thickness of Subsoil</u>	<u>Available Moisture Capacity</u> (inches of water per 60 inches of soil depth)	
Thin 0 - 6 in.	Thin 0 - 6 in.	Very high	12 in. or more
Mod. thick 6 - 12 "	Mod. thick 6 - 12 "	High	9 - 12 in.
Thick 12 - 18 "	Thick 12 - 18 "	Moderate	6 - 9 "
Very thick 18 - 36 "	Very thick 18 - 36 "	Low	3 - 6 "
		Very low	Less than 3 in.
<u>Reaction</u>	<u>Natural Soil Drainage</u>	<u>Inherent Fertility</u>	<u>Organic Content</u>
Acid (6.5 pH or less)	Well drained	High	High
Neutral (6.6 - 7.3 pH)	Moderately well drained	Moderate	Medium
Alkaline (7.4 pH or more)	Imperfectly drained or somewhat poorly drained	Low	Low
	Poorly drained	Very low	
	Very poorly drained		
<u>Slope</u>	<u>Erosion</u>	<u>Wetness</u>	
Nearly level	No apparent or slight	Slightly wet:	Growth of crops slightly affected or planting dates delayed for brief periods;
Gently sloping	Moderate	Moderately wet:	Growth of crops moderately affected or planting dates delayed by a week or so;
Moderately sloping	Severe	Very wet:	Growth of crops seriously affected or planting delayed as much as a month or more;
Strongly sloping	Very severe	Extremely wet:	Swamp, marsh, too wet for cultivated crops or improved pasture.
Steep	Very severely gullied land		
Very steep			
<u>Salinity</u>		<u>Frequency of Overflow</u>	
Slight: Crop yields slightly affected or range of crops slightly limited;		Occasional overflows or overflows of short duration:	Crops occasionally damaged or planting dates delayed;
Moderate: Crop yields moderately affected or range of crops moderately limited;		Frequent damaging overflows or overflows of long duration:	Crops frequently damaged or range of crops limited;
Severe: Crop yields seriously affected or range of crops severely limited;		Very frequent overflows or overflows of very long duration:	Not feasible for cultivated crops.
Very severe: Growth of useful vegetation prohibited except some salt-tolerant forms.			

